

SKYLIGHT KIT AND METHOD

Background of the Invention

Field. This invention relates to skylights. In particular, it relates to a skylight conversion kit particularly adapted to convert evaporative cooler cooling system piping into a sealed skylight with a plurality of cleanable, insulated interchangeable interior decorative ceiling windows.

State of the Art. A number of skylight systems are known. *Estrada*, U.S. Pub. No. 2003/0000159A1, publication date January 2, 2003 provides a skylight system including a light-admitting cap adapted to fit over a grooved flashing. The grooves are constructed such that they dissipate heat and remove condensation, but will not admit the passage of unwanted objects or bugs through an extension tube into the interior covered with a filter and a diffuser adapted to moderate the intensity of the admitted light. *Rillie*, U.S. Pub. No. 2003/0061775A1, publication date April 3, 2003 provides another skylight tube with reflective film and surface irregularities to maximize the amount of light transmitted from the top of the skylight to a room below the skylight. Surface irregularities are formed in the shaft or adhesive that holds the film onto the shaft to diffuse the light and thereby prevent formation of focal "hot spots" through the diffuser into the room below.

DeBlock, U.S. Pub. No. 2003/0066254A1 published April 10, 2003, discloses a tubular skylight with improved on-piece curb and tube for ease of manufacture and installation. The one-piece tub/curb has a tube and flashing integrally molded of plastic. The tube extends above the flashing to support a dome and below the flashing to connect to an adjacent light tube section. The tube preferably includes a reflective inner surface

to enhance light conveyance. *Hoy et al.*, U.S. Pub No. 2002/0051297A1 published May 2, 2002 discloses a light conducting tube for a skylight having a square or rectangular cross-section and light reflecting inner surfaces. The tube is formed with flat semi-rigid sidewalls flexibly connected at the corners for collapsing or folding the tube between a generally flat storage and shipping position and an expanded tubular position for installation. The tube extends within an attic of a building with its upper open end portion covered by a light transmitting skylight attached to the roof of a building and its lower open end covered by a light transmitting and diffusing panel or lens attached to a ceiling. *Hoy et al.*, U.S. Patent No. 6,604,329B2 dated August 12, 2003 discloses a light conducting tube for a skylight having a square or rectangular cross-section and light reflecting inner surfaces. The tube is formed with flat semi-rigid sidewalls flexibly connected at the corners for collapsing or folding the tube between a generally flat storage and shipping position and an expanded tubular position for installation. The tube extends within an attic of a building and its lower open end portion covered by a light transmitting and diffusing panel or lens attached to a ceiling of a building.

Deblock, et al, U.S. Patent No. 5,983,581 issued November 16, 1999 discloses a tubular skylight with an off-set dome to improve the efficiency of the skylight and reduce the shadows cast. The dome includes a substantially vertical rear face having an integral prism in a portion of its outer surface and the rear face is offset inwardly from the perimeter of the reflective tube, thus allowing light to escape from the bottom edge of the rear face downwardly into the reflective tube. The integral prism does not extend to the top or front face of the dome, thus reducing the prevalence of shadows created by light rays entering the dome through the prism.

Grub, U.S. Patent No. 6,256,947B1 issued July 10, 2001 discloses a method and apparatus for a tubular skylight system. It has a clear acrylic outer dome, an aluminum flashing, an aluminum light tube, an aluminum ceiling plaster ring, and prismatic diffuser. The acrylic dome is imprinted to refract a substantially increased amount of natural light down into the light tube.

Van Dame, U.S. Patent No. 4,733,505 dated March 29, 1988 discloses an energy-efficient skylight structure that is sealed at the room ceiling rather than at the roof membrane, thereby subjecting the attic area to moisture exposure. The light diffusing panels are sealed to the frame in the ceiling with hinged mounts so that they may be opened for cleaning and replacing burned-out bulbs that may be mounted around the periphery of the ceiling hole. A light transmitting tube of flexible material channels daylight from the translucent roof membrane to the hole in the ceiling. The fixture framework is fastened to the support joists of the ceiling and covers the hole in the ceiling.

Chao et al., U.S. Patent No. 6,035,593 issued March 14, 2000 discloses a tubular skylight with snap assembly and expansion spacer to aid in interconnecting the tubular components and using snap clips to add the light diffuser section. It may employ at least one radially protruding lower tab, and the skylight assembly includes a skylight tube assembly formed with at least one lower notch for receiving the at least one lower tab therein to engage the skylight tube assembly with the lower support ring.

Grubb, U.S. Patent No. 5,878,539 issued March 9, 1999 discloses a method and apparatus for a tubular skylight system having a clear acrylic outer dome, and aluminum flashing, an aluminum light tube, an aluminum ceiling plaster ring, and a prismatic

diffuser. The outer dome includes an aluminum ring around the base of the dome, which contains a circular channel and holes, which provide for increased heat dissipation and condensation removal. This aluminum ring also allows the outer dome to be attached directly to the roof flashing decreasing the risk of cracks to the dome. The surface of the acrylic dome is imprinted to refract a substantially increased amount of natural light down into the light tube. The other end of the tube is covered and extends to the inside surface of a ceiling to disperse light into the building, while sealing the tube from transmitting dust water and bugs. The tube is also flexible and floats to compensate for “roof sag.”

Van Dame, U.S. Patent No. 4,833,838 issued May 30, 1989 discloses an energy-efficient skylight structure that is sealed at the room ceiling rather than at the roof membrane, which can lead to moisture entering the attic. It includes a sealed light-diffusing panel attached to the ceiling, a light tube to channel light from the roof membrane structure, which is constructed on site using lengths of light-reflective material and special fastening means that provide versatility in negotiating attic obstructions.

Chao et al., U.S. Patent No. 6,219,977B1 issued April 24, 2001 discloses a tubular skylight with round-to-square adaptor to provide a skylight for non conventional ceilings having rectangular support grids. The rectangular shaped diffuser is designed to diffuse light delivered from a tubular duct system into a rectangular pattern onto panels supported by the ceiling grid.

Chao, U.S. Patent No. 5,896,712 issued April 27, 1999 discloses a roof-mounted light collecting skylight cover for a tubular skylight, which has a dome and frusto-conical skirt depending downwardly from the dome. It has a skirt defining an open circular

periphery with plural circular grooves on the inside surface to direct light into a vertical reflecting tube that is in communication with the cover, such that the light propagates downwardly through the tube through a ceiling-mounted light diffuser to illuminate the interior of an interior room.

There remains a need for an insulated skylight system with an insulated light tube leading from and sealed to the roof with an insulated light transmitting plate to transmit light there through and onto an interior removable interchangeable decorative insulated plate which is easily removed for cleaning, adding additional insulated plates, or changing interior decor when desired. The invention described below provides such an invention.

Objectives of the Invention. The objective of the present invention is to provide an interchangeable insulated decorative paned interior light diffuser for a light tube leading from the roof to the room interior.

A further objective is to provide an easily installed skylight assembly, which is energy efficient and sealed at both the roof and room interior.

Still a further objective is to provide a skylight assembly, which has an insulated light tube to minimize heat transfers and condensation build-up.

Thus, there is a need for an easily installed skylight assembly with openable interchangeable insulated colored and patterned interior light diffusers to suit the preferences of a user. It also indirectly better insulates the skylight assembly to minimize heat transfers into and out of the interior.

Summary of the Invention

The invention comprises a skylight conversion kit for light channeling systems extending between the roof and the interior ceiling, such as swamp cooler ducts. It has a plate positioning segment in communication with and adapted to removably secure over the interior end of a light channeling system extending between a roof and its room interiors. A ceiling mount is secured over the plate positioning segment entry into the ceiling interior and is structured to hold a plurality of insulated decorative plates over the has a decorative trim finish approximately two inches wide to hide any evidence of the channeling system entry. It may includes a gasket and structure to removably seal and secure the mount over the plate positioning segment of the light channeling system entry. The ceiling mount and plate positioning segment is preferably square and is sized to hold a plurality of insulated stackable decorative light diffuser plates, which transmit light there through into the interior of a room. The mount allows a plurality of plates to be stacked to provide the desired insulating properties at various times of the year. The ceiling mount and plate positioning segment allows the plates to be lifted and turned on edge within the plate positioning segment to be removed through the hole in the ceiling mount so that the number of plates can be added or removed periodically for cleaning or additional insulating as necessary to maintain the desired interior temperature. The decorative plates are also patterned and colored to suit the preference of a user, and may be interchanged to match varying decors. Each decorative plate may also have different insulating properties, which are then employed by stacking the required number and types in multiples to provide the required insulating factor.

The plurality of insulated stackable decorative plates may be separated with a gasket spacer system to leave an air space between them and absorb shocks and prevent accidental damage thereto in the event of accidental contact or excessive house vibration.

A roof mount is included and adapted to secure to the roof over the exterior end of the light channeling system an insulated light transmitting plate to allow exterior light to enter and pass through the light channeling system. The light transmitting plate is preferably flat to minimize visual interference with rooflines. It also insulates the opening to the light channeling system and prevents the entrance of moisture, bugs, and dust.

Where there is an existing light channeling system, such as evaporative cooler ducts, the skylight conversion kit includes flexible insulating material to wrap there around and insulate the same. If there is no existing light channeling system, the kit includes a flexible insulating tubular system with interior light reflecting properties to connect the roof. This flexible tubing may be cut on-site to fit the attic space available, preferably at an angle to prevent hot spots from being transmitting into the interior of the room.

To use the invention, a hole is cut in the roof and ceiling and interconnected with the flexible insulated tubular system such that its interior light reflecting surfaces transmit exterior light into the interior. The hole in the roof is then capped with the roof mount sealed to the flashing, and the hole in the ceiling is covered with the ceiling mount containing a plurality of insulated plates. The number of insulated plates is selected and inserted to provide the desired insulating properties, and the pattern and color of the plates varied to provide the desired interior décor.

To convert swamp cooler ducting with one end opening to the roof and the other opening leading into the room interior into a skylight, a plate positioning segment with an opening is installed proximate the ceiling such that its opening is in communication with the interior end of the duct work such that it leads into the room interior. A ceiling mount with an opening is installed over the plate positioning segment opening entering the room interior. The ceiling mount has structure to hold over the positioning segment opening one or more insulated stackable decorative plates sized and shaped to cover the ceiling mount opening and lift and move within the positioning segment for addition or removal. A number of insulated stackable decorative plates can thus be stacked on the ceiling mount in a manner, which transmits light there through into the interior of a room. The number of decorative plates is selected and added to provide the desired decorative and insulating properties at various times of the year. The number may be adjusted periodically to maintain the desired interior temperature, or seasonal decorative theme, such as adding decorative Christmas plates in the winter, or Easter plates in the spring.

A roof mount with opening adapted to secure to the roof is then placed with its opening positioned over the exterior end of the evaporative cooling duct. The roof mount has structure to seal thereto at least one insulated light transmitting plate sized to cover and seal the roof mount opening to allow exterior light to enter and pass through the evaporative cooling ducts. The light transmitting plate insulates the exterior end of the evaporative cooling duct opening to transmit light there through while preventing heat transfer and the entrance of moisture, bugs, and dust.

The shape of the plates and opening of the ceiling mount may be varied from square to oblong, to any geometric shape which can be removed through the opening in

the ceiling mount by lifting and turning it within the plate positioning segment on edge to pass through the diagonal of the ceiling mount opening for removal without unscrewing the ceiling mount. These varying shapes allow interesting decorative light touches, utilizing insulated decorative plates, which can be interchanged to suit the style and insulating preferences of a user.

For old evaporative cooler ducting installations which are still wired for power, a light may be wired within the ducting to act as a night light, while still allowing sufficient light to pass there through for use as a skylight during the day.

Description of the Drawings

Fig. 1 is a perspective view of one preferred embodiment of the invention employed with a swamp cooler duct.

Fig. 2 is a perspective side view of another preferred embodiment of the invention including an insulated sleeve and plate positioning coupling.

Fig. 3a is a top view of a preferred insulated decorative plate.

Fig. 3b is a side view of the embodiment shown in Fig. 3a.

Fig. 4a is a top view of a ceiling mount.

Fig. 4b is a side view of the ceiling mount shown in Fig. 4a.

Fig. 5 is a top view of a preferred roof mount.

Fig. 6a is a top view of a preferred roof insulating plate.

Fig. 6b is a side view of the preferred roof insulating plate shown in Fig. 6a.

Figs. 7a, 7b, and 7b are top views of different sized and styled decorative plates.

Description of the Illustrated Embodiments

The invention 10 shown in Fig. 1 is a perspective view of one preferred embodiment of a skylight conversion kit employed with a square swamp cooler duct 12. It is employed when a swamp cooler is removed from a roof, leaving holes in the roof and ceiling. A ceiling mount 14 with an opening 16 surrounded by flanges 18 is adapted to extend into and secure to the inside of the swamp cooler duct 12 extending between a roof and its room interiors with screws passing there through into the joists. Preferably the dimensions of the ceiling mount 14 are of a size to fit within standard joist spacings for ease of installation. The ceiling mount 14 also preferably has a two inch wide trim 19 shown in Fig. 4a, which extends over the swamp cooler duct 12 room entry point and covers it and any ceiling water stains.

The lower segment of a square swamp cooler duct itself provides a plate positioning segment proximate the ceiling. The ceiling mount 14 has lip structure 21 shown in Fig. 4 along its opening 16 to support and hold double acrylic insulated decorative plates 20, which extend slightly over the ceiling mount opening 16 on the lip structure 21 and are held between the flanges 18. The decorative plates 20 shown in Figs. 3a and 3b are inserted and removed by lifting and turning them on edge within the plate positioning segment of the duct 12 so that they slip through the diagonal of the square opening 16 of the mount 14 for cleaning or stacking.

When inserted and stacked on the ceiling mount 14, they transmit light entering the duct 12 into the interior of a room. Various types of decorative plates 20, such as clear, smoked, patterned, opaque glass, plexi-glass and other transparent plastic materials

may be employed. Thus, the number of decorative plates 20 is selected and added to provide the desired decorative and insulating properties at various times of the year.

A roof mount 22 with an opening 24 is adapted to secure to the roof such that the opening 24 is positioned over the exterior end of the evaporative cooling duct 12. It is structured to seals thereto at least one insulated light transmitting plate 26 shown in Figs. 6a and 6b sized to cover and seal the evaporative cooling duct 12 opening to allow exterior light to enter and pass through the cooling ducts 12, while insulating the exterior end of the duct 12 opening to transmit light there through while preventing heat transfer and the entrance of moisture, bugs, and dust. This embodiment has a hinged light transmitting plate 26 to open, if desired.

Where the swamp cooler ducting 12 includes a power source, an optional light or nightlight 28 shown in Fig. 1 may be added using existing swamp cooler wiring to artificially light the room interior in the evenings.

If desired, the cooling duct 12 may be wrapped with an insulating wrap (not shown) to minimize heat transfer through the skylight

The preferred insulated light transmitting plate covering the exterior end of the cooling duct 12 is double paned and flat as shown in Figs. 6a and 6b. It is made of two panes 20 joined with a solvent weld shown in Fig. 6b for water and airtight sealing. Preferred double panes 20 have a top clear plate 20a and a bottom more opaque plate 20b which diffuses light. The clear plate 20a of the double panes generally provides a smoother surface to aid in cleaning and is usually positioned facing within the ducting 12.

A gasket system (not shown) may be placed along the perimeter between a plurality of insulated stackable decorative plates 26 to isolate them and absorb vibration to prevent accidental contact and vibration damage.

The decorative plates 20 may have different insulating properties and be employed in multiples to provide the desired insulating factor for the skylight kit.

If the evaporative cooling ducting 12 is cylindrical with round openings, a plate positioning connection box 30 shown in Fig. 2 is included. It is mounted in communication with the cylindrical tube ducting 12 to provide a rectangular chamber with a square cross-section, such that the decorative plates 20 may be lifted and turned on edge for removal through the ceiling mount opening for replacement, and cleaning.

Fig. 2 is a perspective side view of another preferred embodiment of a skylight kit, which provides a skylight where there is no existing ducting. It includes an insulated flexible sleeve 32 with an interior reflective surface. It has an exterior end adapted to attach to a hole in a roof and transmit light there through to the interior end associated with a plate positioning box 30 via a dove-tail topped coupling 34 having a square opening adapted to attach to a hole in an interior ceiling to transmit light into a room interior. A ceiling mount 14 similar to that described above is then installed to a joist to secure over the opening of the plate positioning box 30. Similar insulated stackable decorative plates 20 are sized and shaped to cover the ceiling mount opening and lift and move within the plate positioning box 30 for addition or removal as described above.

A roof mount 36 secures to the end of the flexible sleeve 32 and secures to the roof via a flashing 38 placed under the roof shingles and connected thereto with a dove-tail coupling 39. The mount 36 has an opening positioned over the exterior end of the

flexible sleeve, and seals thereto at least one double insulated light transmitting plate 40 which allows exterior light to enter and pass through the flexible sleeve 32, while insulating the exterior end of the skylight while preventing heat transfer and the entrance of moisture, bugs, and dust.

Although the plate positioning box 30 and ceiling mount 14 are shown as rectangular with square cross-sections, any decorative shape may be employed with corresponding shaped plates 20, provided that they may be lifted and turned on edge for removal through the opening of the ceiling mount for replacement, and cleaning.

Figs. 7a, 7b, and 7b are top views showing different sized and styled decorative plates 20, which can be inserted in different sized ceiling mounts 14 showing the wide varieties of room décor which can be employed.

Preferably the dimensions of the skylight kit components correspond to conventional joist openings and equipment ducting used in the construction and refrigeration building trades to standardize installation.

Although this specification has referred to the illustrated embodiments, it is not intended to restrict the scope of the appending claims. The claims themselves recite those features deemed essential to the invention.